

What is claimed is:

1. A surgical device comprising:
a sensor element capable of detecting interaction of the device with the
5 environment, and wherein non-visual information relating to the device interaction can be
communicated to a user of the device.
2. The device of claim 1 wherein the sensor element detects physical
interaction, electrical properties or spatial relation of the device.
- 10 3. The device of claim 1 wherein the sensor element detects static or
dynamic motion of the device.
4. The device of any one of claims 1 through 3 wherein the device
15 interaction is amplified and then communicated to the user.
5. The device of any one of claims 1 through 4 wherein tactile or auditory
indication of forces imparted upon the device can be communicated to a user of the
device.
- 20 6. The device of any one of claims 1 through 5 wherein the sensor element
transmits an electrical signal in response to forces imparted on the device.
7. The device of any one of claims 1 through 6 wherein the sensor element
25 generates electrical signals based on forces imparted on the instrument distal end.
8. The device of any one of claims 1 through 7 wherein the device is adapted
for a microsurgery procedure.
- 30 9. The device of any one of claims 1 through 8 wherein the device is a
surgical pick adapted for eye surgery.

(10.) The device of any one of claims 1 through 8 wherein the device is adapted for neurosurgery.

5 11.) The device of any one of claims 1 through 10 wherein the device comprises a sensor element through a substantial length of the device.

12. A surgical device comprising:
a sensor element capable of detecting forces imparted on the device, and wherein
10 information relating to the imparted forces can be communicated to a user of the device, the imparted forces may be static or dynamic.

13. The device of claim 12 wherein the device interaction is amplified and then communicated to the user.

15 14. A surgical device comprising:
a sensor element capable of detecting interaction of the device with the environment, wherein information relating to the interaction can be amplified and transmitted to a user of the device.

20 15. The device of claim 14 wherein the device transmits to the user tactile or auditory indication of the device interaction.

16. The device of claim 14 or 15 wherein the sensory element transmits an
25 electrical signal of the device interaction.

17. The device of claims 14 through 16 wherein the sensor element can generate electrical signals based on forces imparted on device.

30 18. The device of any one of claims 14 through 17 wherein the device is adapted for a microsurgery procedure.

19. The device of any one of claims 14 through 18 wherein the device is a surgical pick adapted for eye surgery.

5 20. The device of any one of claims 14 through 19 wherein the device is adapted for neurosurgery.

21. A surgical device comprising:

(a) a sensor element, wherein the sensor element can generate a electrical
10 signal based on forces imparted on the device, which forces may be static or dynamic;

(b) an electronic controller that can generate an output signal based on the proportional electrical signal; and

(c) an output transducer that receives the output signal, thereby producing a proportional sensory signal.

15 22. The device of claim 21 further comprising energy conducting apparatus that can transmit the output signal from the electronic controller to output transducer

23. The device of claim 21 or 22 further comprising apparatus that can
20 transmit electric signals between the sensor element and the electronic controller.

24. The device of any one of claims 1 through 23 further comprising a power
source for the device.

25 25. The device of claim 24 the power source is connected to the device through an electrical cable.

26. The device of claim 24 wherein the device comprises a battery.

30 27. The device of any one of claims 21 through 26 wherein the output transducer is any one of a speaker, earphone or headphone.

28. The device of any one of claims 21 through 27 wherein the output transducer is an electromechanical transducer.

29. The device of claim 28 wherein the electromechanical transducer is attached to the grip portion of the device.

30. The device of claim 28 wherein the electromechanical transducer is attached to a medical practitioner that uses the device.

31. The device of any one of claims 12 through 30 wherein the sensor element determines any one of physical interactions, electrical properties, or spatial relations.

32. The device of any one of claims 21 through 31 wherein the sensor element comprises a piezopolymer.

33. The device of claim 32 wherein the piezopolymer generates an electric signal when flexed that is proportional to the degree of flexion.

34. The device of any one of claims 1 through 33 wherein the sensor element comprises strain gauges contained within or attached to the shaft.

35. The device of any one of claims 21 through 34 wherein the electronic controller operates under microprocessor control.

36. The device of claim 35 wherein the microprocessor includes the ability to adjust the sensitivity and threshold of operation of the device.

37. The device of any one of claims 1 through 36 wherein the surgical device is self contained.

38. The device of any one of claims 1 through 37 wherein the surgical device is adapted for ophthalmic procedures.

39. The device of any one of claims 1 through 38 wherein the surgical device is adapted for neurosurgical procedures.

40. The device of any one of claims 1 through 39 wherein the device can be sterilized.

41. The device of any one of claims 1 through 40 wherein one or more parts of the device are modular.

42. The device of claim 41 wherein one or more parts are disposable.

43. The surgical device of claim 42 wherein one or more parts are reuseable.

44. An surgical device comprising:

- (a) a surgical instrument body;
- (b) a sensor element at a distal portion of the device, wherein the sensor element generates proportional electrical signals based on forces imparted on the device, which forces may be static or dynamic;
- (c) an electronic controller that generates an output signal based on the proportional electric signal and;
- (d) an output transducer that receives the output signal, thereby producing a proportional sensory signal;
- (e) energy transmission apparatus that can transmit the output signal from the electronic controller to output transducer;
- (f) a conductor for transmitting electric signals between the sensor element and the electronic controller; and
- (g) a power source.

45.) A device of any one of claims 21 through 44 wherein the device is a surgical pick.

5 46. A method for surgery comprising:
treating a patient with a surgical device of any one of claims 1 through 45,
wherein information is non-visual information is transmitted to a user of the device based
on forces imparted on the device, which forces may be static or dynamic.

10 47. The method of claim 46 wherein tissue of the patient is manipulated with
the device.

48. The method of claim 47 wherein neurological tissue is manipulated with
the device.

15 49.) The method of claim 47 wherein tissue of a patient's eye is manipulated.

20 50.) A method for surgery comprising:
treating a patient with a surgical device of any one of claims 1 through 45; and
transmitting to a user of the device information of forces imparted on the device,
which forces may be static or dynamic.

51. The method of claim 50 wherein the information is transmitted in real-
time to a user of the device.

25 52. The method of claim 50 or 51 wherein the information is amplified and
then communicated to the device user.

30 53. The method of any one of claims 50 through 52 wherein the device
transmits tactile or auditory indication of the forces imparted upon the device.

54. The method of any one of claims 50 through 53 wherein a sensory element of the device transmits an electrical signal of forces imparted on the device.

55. The method of any one of claims 50 through 54 wherein tissue of the
5 patient is manipulated with the device.

56. The method of claim 55 wherein neurological tissue is manipulated with the device.

10 57. The method of claim 55 wherein tissue of a patient's eye is manipulated.

58. A medical device kit, comprising a device of any one of claims 1 through 45.

15 59. The kit of claim 58 wherein the device is packaged in sterile form.

60. The kit of claim 58 or 59 further comprising an instruction sheet.

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